

elevation



The Journal of the Society of Façade Engineering
July 2006

Responding to Europe: How much glass?

SOCIETY OF
FAÇADE
ENGINEERING

Welcome to the first issue of *Elevation*. As the Society of Façade Engineering grows, its newsletter is growing too. We will be expanding the original newsheet, whilst endeavouring to cover a broad spectrum of the activities of members; together with peripheral topics that we hope will be of interest to all. *Elevation* is a resource for members, and it will require input from the members to make it work. So firstly, we need your comments and feedback, then we need interesting or provocative articles to keep the channels open. Please use *Elevation* as your opportunity to input and gain from the community of facades related professions that is the Society of Façade Engineering.

Hotting up the Glass Debate

Hot air is not just generated by poor façade design; there's plenty more of it around from current speak about what is a well designed façade... more to the point: how much glazing is right? So our theme this issue is centred on the glass question. As the Energy Performance of Buildings Directive and new approved documents become operative, the old debate becomes more relevant. The Glass Debate Conference hosted in March by Glass Age magazine brought key industry proponents in for open debate about this issue, which generates so much reaction. Glazing buildings has become an emotive modernist mantra that goes beyond the technical and into the realms of the untouchable. Right or wrong? You decide.

The introduction of a new second tier document in support of the Building Regulation approved documents will help us make more enlightened decisions about glass. This and the Glass Debate conference are reviewed, together with two case studies to illustrate the diametric dilemma of glass: *Bibliothèque Nationale de France* and the *British Library*, two contemporary buildings with the same status and function, but poles apart in their fundamental approach to the façade.

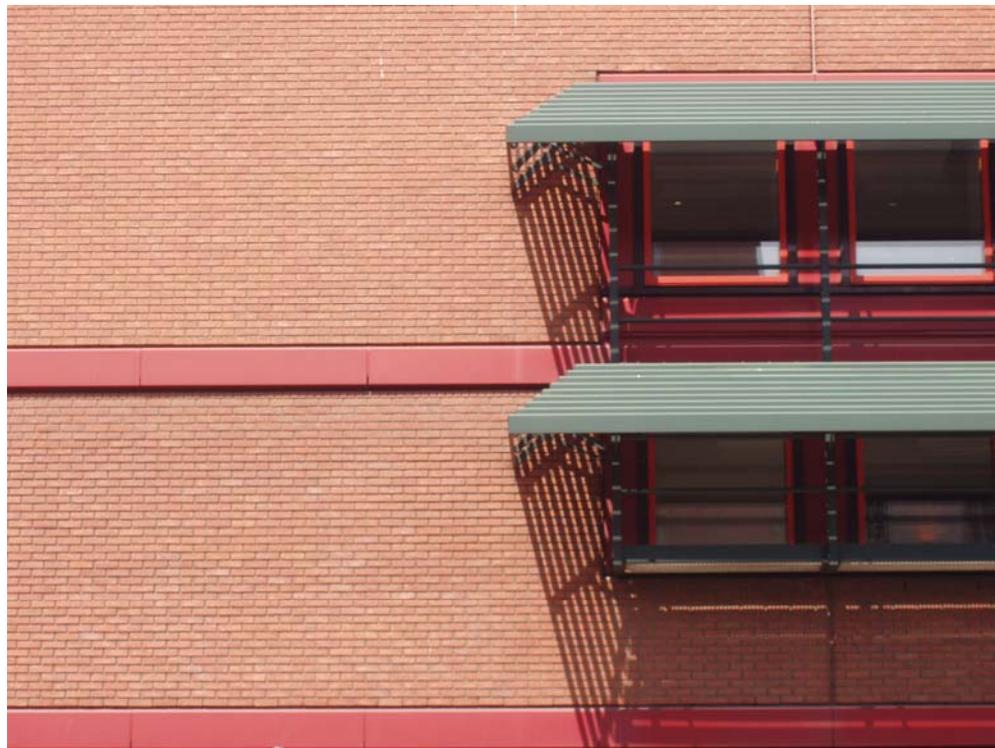
Report: The Glass Debate Conference

Former editor of *Building Design*, **Rob Booth** opening batting by recounting the time when he published an article arguing the case for glass in facades where it needed to be, and not all over. "It produced a storm among our readership" he reflected, "They interpreted it as an attack on the guiding principles of contemporary architecture of the last 10 to 30 years". He discussed the relationship between architects and glass, which goes back a long way, but now faces a new challenge within their ranks... The Glass Debate was on.

against...

Sean Affleck, of Make architects emphasised the need for designers to change the habit of starting with buildings made entirely out of glass, and to focus first on sustainability. He cited contemporary schools as the classic example, "We're building all glass buildings which would bake or lightly freeze our students if it wasn't for air conditioning", adding that all-glazing isn't necessary to sell the building.

Atelier Ten's **Patrick Bellew**, used emission statistics to reinforce the argument: UK buildings contribute 50% of UK output and London buildings contribute 70%. "All glass buildings will be seen as second class, as very eighties", he proposed, adding that clients are often not concerned about glazing levels, focussing more on getting a good building on time and on budget. Tenants currently are not so concerned with cost in use, as it is a relatively small element of overall running costs. The industry should look at running costs from day one, and consider energy as a valuable resource: we should advise the client about 'gas guzzling buildings'. Responsibility for 'good weather' in buildings rested with the architect in days before air conditioning, then it shifted to the engineer.



From now on it is teamwork, but the biggest problem to deal with is overheating from over-glazing.

for...

Stephen Ledbetter, from the Centre for Window Cladding & Technology opened the reply by bringing the psychological and health effects of natural light into the discussion, adding that the principle of the building skin as a filter to keep things out and let things in, adds a new complexity to the debate. "We do have this dichotomy of whether buildings should be closed or open", he noted, adding that, "We shouldn't lose sight of what we are trying to achieve with the overall performance of the building envelope... Do we want to design buildings with lower glass ratios to simplify designs for cooling? One cop-out when you sit with your energy model is to downsize the area

of glass and not worry too much about the internal environment or the physiological needs of the occupants in terms of daylight. Or should we put in design effort to deliver buildings with more glass for all aspects of building performance? I would argue for the latter... Ultimately, glass produces some stunning buildings, and I think everyone can recognise those buildings which look really good when they are glazed". He further emphasised the importance of getting lighting correct in a building and that glass can be more than we normally think of: it can be changed completely when laminated with translucent marble veneer.

Glass technology is improving all the time and costs are reducing with time. CWCT have been experimenting with a 'plug and play' window, which has a circuit controlling top and bottom vents and a blind. The possibilities are manifold, with the chip

costing 50 pence per window, "It's this kind of technology that will allow us to combine our blinds with our lighting" he claimed.

Matthew Kitson, of Hilson Moran Partnership focussed on the Energy Performance Directive, proposing the need for performance feedback and comparing building performance certification to that currently in use for white goods: from the original scale of A to G, people now want to buy A+.

"What we need is another debate about the certification of the energy consumption of buildings", he noted.

it depends...

Arup's **Graham Dodd** is a materials specialist. "When I first heard that glass was dead, I was very worried", he claims, "But being an engineer, it only took me about three days to work out that glass is really shorthand for transparency. For the last 100 years or more we've been using glass to achieve transparency. I think now is an opportunity to use glass that is NOT pretending that it's not there". He explained: "...glass is a metaphor for open government and transparency - and the imperative is to control these flows of energy in and out of the façade". He went on to explain that although selective coatings can get to a point where they almost reject everything that isn't visible light, there is still considerable energy in the visible wavelengths. "That message has finally hit home, and almost everyone recognises that if you let all the light in, you've just got too much energy", he claimed. But it's not all bad news for glass, which he identifies as, "a great substrate for chemical and biological processes engineered on the surface". The engineering he referred to is nano engineering: hydrophobic, hydrophilic, photovoltaic, electrochromic coatings are on the way. "The future is more active surfaces, energy conversion, being able to vary the reflection, the conversion of energy as we want to; and using glass to deliver colour and translucency, texture and opacity. The forms are going to get more complex, and maybe the transparency's going to move into the interior of the building". He concluded.

Light, to **Grant Daniels**, of Zumtobel Staff Lighting, is the Elixir to well-being in the workplace. He summarised research proving that different forms of lighting can have an impact on motivation, persistence, vigilance, accuracy, comfort, satisfaction and happiness of an individual and hinted at a strong correlation with human performance in terms of efficiency in the workplace. He went on to relate the minimal cost of linking an electric lighting system with a blinds control system, to that of the overall



Case Study:
Bibliotheque Nationale de France
(front cover)

Architect:
Dominique Perrault
Contents:
Books, manuscripts, exhibition rooms, offices and ancillary spaces
Look:
Four giant transparent bookends on a podium—book stacks in the air
Facades:
Unitised fully glazed curtain wall with internal manually operated door flaps for solar shading and glare control
Impressions
Nearly all the shading flaps were closed on the overcast summer day I visited, so it was over to artificial lighting to provide internal illumination (ed)

Case Study:
The British Library
(photo opposite)

Architect:
Colin St. John Wilson
Contents:
150 million books, manuscripts, exhibition rooms, offices and ancillary spaces
Look:
Tough introspective blank box – famously described by Prince Charles as "an academy for secret policemen"
Facades:
Brick with punched windows and solar shading canopies
Impressions
During a packed Part L training session, our conference room got mighty hot and stuffy in spite of the façade design. The reading and exhibition spaces seem fine for a library but could do with a few more glimpses of daylight (ed)



scheme of things, with much better comfort conditions for the end user. "Let the mechanical engineer specify the glass to meet the required performance; bring the lighting specialist in to advise on seamless daylight / electric lighting integration; use light re-directing blinds on the top third of the window, use controllable re-directing blinds for mid-third, and re-configure the luminaire layout to take advantage of increased daylight penetration. Lighting is a very important issue, and we should move it more central to the agenda", he proclaimed.

Ant Wilson of Faber Maunsell reiterated the provisions of the Building Regulations New Part L: controlled fittings, controlled services and controlled elements have to

be juggled alongside controlled air leakage to achieve the targets. The building is not finished until commissioning is completed and testing data is fed back into the calculations to give the as-built asset rating. According to Ant, "Part L will highlight what is supposed to have gone in, because if it's not there, it won't meet the target".

Finally, **Paul Everall** of LABC summarised the routes to regulatory compliance by Partner Authority Scheme and Type Approval.

Diary

19 September 2006: Society event at Win-tech test laboratory in Telford. Details to be circulated.

30 November 2006: The Glass Debate II. Look out for details in Glass Age magazine.

28 - 30 March 2007: ICBEST (International Conference for Building Envelope Systems and Technology) at University of Bath.
www.icbest.org

For membership and other information about the Society of Façade Engineering visit www.cibse.org

Please help us by submitting comments, articles, letters and information for publication to the editor, Mark Taylor, email: SFE@cibse.org

New Documentation

A new type of building a new way of design

CWCT has published 'The thermal assessment of window assemblies, curtain walling and non-traditional building envelopes' the second tier document referenced from the Part L2A of the Building Regulations. Stephen Ledbetter describes the impact of Part L2 on the building process.

Part L of the Building Regulations (England and Wales) published in April this year has changed not only what we can build but also how we design. Part L2A, which covers new build commercial and institutional buildings, requires a calculation of total carbon dioxide emissions to show acceptable performance. The actual carbon dioxide emission of the complete building will depend on both the building envelope construction and the building service solution.

So how will buildings be different?

The Building Regulations consider that a building might overheat and they set requirements for cooling, ventilation and shading. This need not limit the area of glass used but will require a greater use of coated glasses for solar control and of brise soleil that are designed to give a calculated amount of solar shading.

Part L2A also puts a greater emphasis on cold-bridging and the in-plane heat flow associated with it. This requires better insulated glazing frames and a reduction in the number of cold bridges. Additionally point bridges such as support brackets for rainscreen panels or brise soleil have to be considered. Methods of calculating U-values for simple curtain walls and the more complex variations on them are given in the new publication from CWCT, 'The thermal assessment of window assemblies, curtain walling and non-traditional building envelopes'. This is a second tier document referenced by the Building Regulations.

Finally the new part L requires that all buildings should emit between 20 and 28 per cent less carbon dioxide unless they use energy from renewable sources. This reduction is likely to be achieved by improving both the efficiency of the services and the performance of the building envelope. This will require better insulation as well as better shading and reduced thermal bridging.

So how will design be different?

Part L2A now links the building envelope and the building services through the carbon emissions calculations in such a way that they cannot be considered separately. At the same time it gives greater design flexibility allowing the designer to trade envelope improvements against improvements to the building services. Carbon

emissions are calculated using the National Calculation Method.

It is now recommended that preliminary carbon emission calculations be undertaken at an early stage in the design. If this is not done then the design at planning stage may lead to a non-compliant building for which the building services cannot be 'tweaked' to make it comply. Subsequent addition of external shading devices may require new or additional planning approval.

To make this possible it is necessary to:

- Involve the building services engineer at an early stage
- Use a building services engineer who understands building envelope technology
- Make sensible estimates of the building envelope performance prior to its detailed design
- Involve the façade designer at an early stage.

The CWCT document 'The thermal assessment of window assemblies, curtain walling and non-traditional building envelopes' gives methods for estimating the U-value of a curtain wall and methods of inputting curtain wall performance into the national calculation method.

How will we specify?

Because of the need to consider the effect of both the envelope and the services it is not possible for a manufacturer, or even a specialist sub-contractor, to say that a component or element complies with Part L2A. An element of the building envelope might meet the worst allowable standards for elements of that type but if used the building may not comply.

The only way to ensure that a building will comply is for the building design team to check compliance on the basis of assumed performance and then specify accordingly. Specification should now include:

- Average U-value of each zone of the building envelope
- Transmittance, absorptance and reflection properties on any glazing within each zone

Additionally the Specifier may wish to state any requirements for U-values of the main components. The glazing properties should take account of any shading devices present and these also have to be specified in terms of transmittance.

How will we construct?

The requirement to limit air leakage through the building envelope was first included in the 2002 Building Regulations. Air leakage was limited to 10 m³/m²/hr at 50 Pa and buildings with floor area in excess of 1000 m² should have been subject to a whole building air leakage test. The new part L2A allows the designer to specify

a tighter building as a way to reduce carbon dioxide emissions. However, the air leakage assumed when calculating carbon dioxide emissions has to be achieved by the completed building. Whole building air leakage tests are required for all buildings with floor areas in excess of 500 m² and the actual air leakage rate is used to calculate the actual carbon dioxide emissions.

Air leakage rates of 10 m³/m²/hr at 50 Pa are now commonly achieved however, rates as low as 5 m³/m²/hr at 50 Pa are more difficult to achieve and should be discussed with the main contractor at an early stage.

Most fenestration products have air leakage rates far less than those required by the building as a whole. However, air leakage at the interfaces between elements of the building envelope and at penetrations gives rise to air leakage that may be too great. As a consequence main contractors increasingly specify air leakage, and U-values at interfaces and assign responsibility for them to one or other specialist sub-contractor.

Your Take

Share you views on the solution to a topical problem This quarter's subject:

Does De-ionised cleaning water affect curtain walls adversely, and if so how?

Letters

From Ant Wilson, Chairman of the Society of Façade Engineering

I would like to welcome Mark Taylor from Allies and Morrison to the role of editor for the new format Society of Façade Engineering Journal. Thanks are also due to Chris Macey from Wintech for editing the last newsletter.

As we move forward as a society we hope the journal will act as a catalyst for the technical advancement of the Façade Engineering industry.

What developments will we see in the coming year with glass technology, better solar control coatings, lower emissivity coatings, more energy efficient gas filled cavities? How will framing systems evolve and will we see a breakthrough with a warm edge spacer technology? How long will it be until triple glazing is the norm in the UK? What proportions of glass will we see in the office of the future. I believe we will see more advance automatic control systems within our buildings with intelligent control coming to the fore. We will also see an increase in monitoring of building performance which will help guide future designs. What do you think?. Please send your letters and emails to Mark Taylor for publication in the next ELEVATION.